

*line of the femur.* If a thigh bone be placed with its lower articular surface upon a table or any horizontal plane, in the position which it normally occupies in the erect posture, a plumb-line would fall from the upper weight-receiving part of the head of the bone, obliquely, through the shaft and through the *outer* condyle (not between the condyles). This, therefore, is the line of weight, and the weight is borne chiefly upon the *inner* part of the shaft above, and below upon the *outer* part of the shaft, the *outer* part of the epiphysial line, and the *outer* condyle. To enable it to fulfil its greater weight-bearing function, the outer condyle, as compared with the inner condyle, is broader and flatter beneath; and a section shows it to be composed of denser cancellous plates, which have a more vertical disposition.

Further, owing to the inclination inwards of the thigh as it descends (which, by the way, is a human feature associated with the width of the pelvis and the erect posture), the muscular traction, viz., that of the *quadriceps extensor*, through the patella, that of the abductors *gluteus maximus* and *tensor vaginæ femoris*, through the ilio-tibial band, and that of the *biceps flexor*, which enjoys the advantage of leverage afforded by the projecting head of the fibula, is in all positions exerted chiefly upon the outer condyle. This conformation and relation of parts, added to the great leverage given by the thigh above and by the leg below, make a demand—rather throw a difficulty—upon the growing force in the outer part of the epiphysial line, which in some young, perhaps rickety, persons it is not quite equal to meet and overcome. It has to be observed that the growth at this epiphysial line is greater and more prolonged than at any other part of the frame. The growth also takes place almost entirely on the shaft side of the line, the addition to the epiphysis from it being slight. The defect, therefore, to which, in the main, I attribute the deformity of knock-knee, is an imperfection in the growth of the *outer* and lower part—the supra-condyloid part—of the shaft of the femur; and the imperfection is to be attributed to the insufficiency of the growing force in this part of the epiphysial line to overcome the resistance offered by the weight of the body and the traction of the muscles.

When the knee affected with this deformity is bent, two things are observed: *First*, that the leg loses its outward slant and assumes its proper direction, viz., in the same plane with the thigh. This is owing to the fact that the circumference of the condyle acquires its normal dimensions, inasmuch as the growth here is not interfered with by any undue pressure, and the hinder, rounder part accordingly projects backwards to the same level as does the corresponding part of the inner condyle. *Secondly*, that the patella has not its usual prominence anteriorly, which is in consequence of the absence of that prominence of the lower part of the outer condyle whereby the patella in the naturally formed knee is carried forward so as to constitute the foremost and most conspicuous feature of the flexed joint.

In the examination of specimens in many museums at home and abroad, by which the above views were confirmed, as they were still further confirmed by the observations of Mikulicz, I have seldom had reason to think there has been any undue amount of growth of the inner condyle or of the part above it; and such hyper-growth, especially unsymmetrical, in an epiphysis or part of an epiphysis, is very rare. I may add that it is difficult to see how the deformity could be produced by a relaxation of ligaments, or by any other cause than an obliquity of one or both of the articular surfaces of the bones of the joint.

Although I thus believe that the essential feature in the pathology of knock-knee is an obliquity of the under part of the articular surface of the femur, consequent on impaired growth of the lower and outer, or supra-condyloid, and chief weight-bearing part of the shaft of the femur, I am well aware that other causes may combine with this one or may exist without it. Such are (1) a similar interference with growth at the outer part of the epiphysial line of the tibia, inducing an obliquity of the articular surface of that bone. This is usually less marked than the corresponding defect in the femur, owing probably, in part, to the less amount of growth which takes place at the upper end of the tibia, as compared with that at the lower end of the femur. (2) The incurving of the lower part of the shaft of the femur, or of the upper part of the shaft of the tibia,